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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/749,435	12/30/2003	George Z. Chrysos	42P17892	9575

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EXAMINER

THOMAS, SHANE M

ART UNIT

PAPER NUMBER

2186

DATE MAILED: 02/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/749,435

Applicant(s)

CHRYSON, GEORGE Z.

Examiner

Shane M. Thomas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                        |                                                                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                            | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

### DETAILED ACTION

This Office action is responsive to the application filed 12/30/2003. Claims 1-12 are presented for examination and are currently pending.

The examiner requests, in response to this Office action, any reference(s) known to qualify as prior art under 35 U.S.C. sections 102 or 103 with respect to the invention as defined by the independent and dependent claims. That is, any prior art (including any products for sale) similar to the claimed invention that could reasonably be used in a 102 or 103 rejection. This request does not require applicant to perform a search. This request is not intended to interfere with or go beyond that required under 37 C.F.R. 1.56 or 1.105.

The request may be fulfilled by asking the attorney(s) of record handling prosecution and the inventor(s)/assignee for references qualifying as prior art. A simple statement that the query has been made and no prior art found is sufficient to fulfill the request. Otherwise, the fee and certification requirements of 37 CFR section 1.97 are waived for those documents submitted in reply to this request. This waiver extends only to those documents within the scope of this request that are included in the application's first complete communication responding to this requirement. Any supplemental replies subsequent to the first communication responding to this request and any information disclosures beyond the scope of this are subject to the fee and certification requirements of 37 CFR section 1.97.

In the event prior art documentation is submitted, a discussion of relevant passages, figs. etc. with respect to the claims is requested. The examiner is looking for specific references to 102/103 prior art that identify independent and dependent claim limitations. Since applicant is

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most knowledgeable of the present invention and submitted art, his/her discussion of the reference(s) with respect to the instant claims is essential. **A response to this inquiry is greatly appreciated.**

**The examiner also requests**, in response to this Office action, that support be shown for language added to any original claims on amendment and any new claims. That is, indicate support for newly added claim language by specifically pointing to page(s) and line no(s). in the specification and/or drawing figure(s). This will assist the examiner in prosecuting the application.

Excerpts from all prior art references cited in this Office action shall use the shorthand notation of (column # / lines A-B) to denote the location of a specific citation. For example, a citation present on column 2, lines 1-6, of a reference shall herein be denoted as “(2/1-6).”

### *Specification*

The disclosure is objected to because of the following informalities:

Line 2 of the abstract should include the correction --an invalidation-- instead of --a invalidation--.

Appropriate correction is required.

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whittaker (U.S. Patent No. 5,699,552) in view of Meyer (U.S. Patent No. 6,378,047).

As per claims 1 and 7, Whittaker teaches requesting an invalidation operation (which by definition is --an operation-- as in claims 7-12) in (7/6-8) and shown in figure 2 as cycle 1a. A fill operation (i.e. placing data in the cache) is shown in figure 2 as the "Previous Processor Cache Operation," which can be a read fill - (7/12-16). Piping (or delaying a cycle) the invalidation request one or more cycles upon receiving a fill request is shown in figure 2 and taught by Whittaker in (7/12-16).

Whittaker does not specifically teach performing invalidations on every block of an indexed set. Meyer suggests that invalidating each cache line (i.e. block) of a particular set of a cache is beneficial when all of the data in a cache is to be written back to main memory (in order to preserve modified data) when a system is being shut down (2/52-57). Such a modification increases overall system performance (2/57-59). During a FLUSH cycle, Meyer teaches simultaneously invalidating every address within a particular cache memory set (11/37-46). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the caching system of Whittaker with the teaching of set

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invalidation of Meyer in order to have increased the overall system performance of Whittaker in by quickly flushing the cache memory back to main memory during shut-down of the system of modified Whittaker.

As per claims 2 and 8, Whittaker teaches where the step of requesting an invalidation operation comprises sending an address of the block (2/24-27).

As per claims 3 and 9, Whittaker teaches if a fill request is not being received (i.e. the invalidation request is being performed - cycles 1 and 2 of figure 2) a tag lookup and a comparison of the addresses found in the index set to the sent address is performed (2/33-44). It is noted that Whittaker does not necessarily teach a set-associative cache (i.e. where a single index would have multiple cache addresses stored in the TAG array); however, Meyer teaches such a limitation (refer to figure 1 and the abstract). Advantages and benefits of set-associative caching are well known in the caching arts (i.e. lowering cache miss rates and increasing system performance).

As per claims 4 and 10, Whittaker teaches the step of clearing a valid bit in the tag array if the addresses match (9/44-45) and (10/43-45 - element (c) of claim 2).

As per claims 5 and 11, if a fill is received, the invalidation is requested in the next cycle as shown in figure 2 by cycles 1a and 1 and also in (7/6-16). If a fill is occurring (such as a read fill from the main memory), the invalidation is pushed until the next cycle, when the fill is complete.

As per claims 6 and 12, Whittaker does not explicitly teach piping (or delaying) the invalidation for three cycles; however, such a limitation is inherently taught in the disclosure of Whittaker. As taught in Whittaker (8/8-20), burst writes comprise four consecutive cycles of

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writes data being stored in the cache. If an invalidation request is currently in the queue (4/36-51) when a write burst begins, an invalidation has been waiting for the cache memory to become available for the four cycles until the write buffer needs to be filled. Because the invalidation must wait four cycles to be serviced, it could have been seen by one having ordinary skill in the art that the step of piping (or trying the invalidation again the next cycle - [page 5, ¶8, of Applicant's specification]) *occurs for three cycles* and then will occur for a fourth before the invalidation will occur (while the write buffer is being re-filled - 8/12-20).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Cohen et al. (U.S. Patent No. 5,551,001) teaches invalidating all lines in a cache having a specified index (10/56-62).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shane M Thomas whose telephone number is (571) 272-4188. The examiner can normally be reached M-F 8:30 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt M Kim can be reached at (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shane M. Thomas



**HONG CHONG KIM**  
**PRIMARY EXAMINER**